We claim:

1. A method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of:

precomputing intersymbol interference estimates based on a combination of (i) speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and (ii) a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state;

precomputing branch metrics based on said precomputed intersymbol interference estimates;

selecting one of said precomputed branch metrics based on a second past decision from a corresponding state;

computing a new path metric for a path extension from a corresponding state based on said selected branch metrics; and

determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics.

2. The method of claim 1, wherein said partial intersymbol interference estimates equal a channel coefficient multiplied by a data symbol value.

3. The method of claim 1, wherein said first or second past decisions from a corresponding state include a survivor symbol.

4. The method of claim 1, wherein said first or second past decision from a corresponding state includes an add-compare select decisions.

5. The method of claim 1, wherein said path metric is an accumulation of said corresponding branch metrics over time.

6. The method of claim 1, wherein said best path metric is a minimum or maximum path metric.

7. The method of claim 1, wherein said reduced-state sequence estimation technique is selected from the group consisting essentially of (i) a decision-feedback sequence estimation technique; (ii) a delayed decision-feedback sequence estimation technique; or (iii) a parallel decision-feedback decoding technique.

8. The method of claim 1, wherein said method allows said reduced- state sequence estimation technique to be pipelined before or after each of said selections.

9. The method of claim 1, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and

combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric.

10. The method of claim 1, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

combining said one-dimensional branch metrics to precompute at least two-dimensional branch metrics; and

selecting one of said precomputed at least two-dimensional branch metrics based on a past decision from a corresponding state.

11. The method of claim 10, wherein said selection of an appropriate at least two-dimensional branch metrics corresponding to a particular state is based on at least two-dimensional survivor symbols from a corresponding state.

12. A method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of:

precomputing intersymbol interference estimates based on a combination of (i) speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and (ii) a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state;

selecting one of said precomputed intersymbol interference estimates based on a second past decision from a corresponding state;

computing a branch metric based on said selected precomputed intersymbol interference estimates;

computing a new path metric for a path extension from a corresponding state based on said computed branch metrics; and

determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics.

13. The method of claim 12, wherein said first or second past decisions from a corresponding state include a survivor symbol.

14. The method of claim 12, wherein said first or second past decision from a corresponding state includes an add-compare select decisions.

15. The method of claim 12, wherein said method allows said reduced-state sequence estimation technique to be pipelined before or after each of said selections.

Trellis claims:

16. The method of claim 12, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

computing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

selecting one of said computed one-dimensional branch metric based on a past decision from a corresponding state; and

combining said selected one-dimensional branch metrics to obtain a multi-dimensional branch metric.

17. The method of claim 12, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

computing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

combining said one-dimensional branch metrics to obtain at least two-dimensional branch metrics; and

selecting one of said at least two-dimensional branch metrics based on a past decision from a corresponding state.

18. The method of claim 17, wherein said selection of an appropriate at least two-dimensional branch metrics corresponding to a particular state is based on at least two-dimensional survivor symbols from a corresponding state.

19. A method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of:

precomputing partial intersymbol interference estimates for each of a plurality of postcursor taps of said channel impulse response, wherein said partial intersymbol interference estimates are based on each possible value for a data symbol;

selecting a precomputed partial intersymbol interference estimate for each of said plurality of postcursor taps other than a first postcursor tap based on a past decision from a corresponding state, wherein a precomputed partial intersymbol interference estimate for a first postcursor tap is a precomputed intersymbol interference estimate;

precomputing branch metrics based on said precomputed intersymbol interference estimate;

selecting one of said precomputed branch metrics based on a past decision from a corresponding state;

computing a new path metric for a path extension from a corresponding state based on said selected branch metrics; and

determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics.

20. The method of claim 19, wherein said past decision from a corresponding state include a survivor symbol.

21. The method of claim 19, wherein said past decision from a corresponding state includes an add-compare select decision.

22. The method of claim 19, wherein said step of precomputing partial intersymbol interference estimates for a given postcursor tap further comprises the step of combining (i) a partial intersymbol interference estimate for a previous postcursor tap, and (ii) a product of a channel coefficient value and a possible symbol value.

23. The method of claim 22, wherein said partial intersymbol interference estimate for a previous postcursor tap is a selected precomputed partial intersymbol interference estimate.

24. The method of claim 22, wherein said partial intersymbol interference estimate for a previous postcursor step is a non-speculative partial intersymbol interference estimate.

25. The method of claim 24, wherein said non-speculative partial intersymbol interference estimate is based on a past decision from a corresponding state.

26. The method of claim 24, wherein said non-speculative partial intersymbol interference estimate is based on a data symbol associated with a corresponding state.

27. The method of claim 19, wherein said reduced-state sequence estimation technique is selected from the group consisting essentially of (i) a decision-feedback sequence estimation technique; (ii) a delayed decision-feedback sequence estimation technique; or (iii) a parallel decision-feedback decoding technique.

28. The method of claim 19, wherein said method allows said reduced-state sequence estimation technique to be pipelined before or after each of said selections.

29. The method of claim 19, wherein said first selecting step comprises the step of selecting a precomputed partial intersymbol interference estimate for a group of said plurality of

postcursor taps other than a first group of postcursor taps based on past decisions, wherein a precomputed partial intersymbol interference estimate for a first group of postcursor taps is a precomputed intersymbol interference estimate.

30. The method of claim 29, wherein said step of precomputing said partial intersymbol interference estimates for a given group of postcursor taps further comprises the step of combining a (i) partial intersymbol interference estimate for a previous group of postcursor taps, and (ii) a combination of products of channel coefficients and possible symbol values for each tap of said plurality of postcursor taps.

31. A method for processing a signal received from a dispersive channel using a reduced-state sequence estimation technique, said channel having a channel impulse response, said method comprising the steps of:

precomputing partial intersymbol interference estimates for each of a plurality of postcursor taps of said channel impulse response, wherein said precomputed partial intersymbol interference estimates are based on each possible value for a data symbol;

selecting a precomputed partial intersymbol interference estimate for said plurality of postcursor taps based on a past decision from a corresponding state, wherein a selected partial intersymbol interference estimate for a first postcursor tap is a selected intersymbol interference estimate;

computing a branch metric based on said selected intersymbol interference estimate;

selecting one of said precomputed branch metrics based on a past decision from a corresponding state;

computing a new path metric for a path extension from a corresponding state based on said selected branch metrics; and

determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics.

32. The method of claim 31, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

selecting one of said precomputed one-dimensional branch metric based on a past decision from a corresponding state; and

combining said corresponding selected one-dimensional branch metrics to obtain a multi-dimensional branch metric.

33. The method of claim 31, wherein said signal is a multi-dimensional signal, and transitions in a trellis processed by said reduced-state sequence estimation technique correspond to multi-dimensional symbols, wherein said steps of precomputing and selecting branch metrics comprise the steps of:

precomputing one-dimensional branch metrics based on said precomputed intersymbol interference estimates;

combining said one-dimensional branch metric to precompute at least two-dimensional branch metrics; and

selecting one of said precomputed at least two-dimensional branch metrics based on a past decision from a corresponding state.

34. The method of claim 33, wherein said selection of an appropriate at least two-dimensional branch metrics corresponding to a particular state is based on at least two-dimensional survivor symbols from a corresponding state.

35. The method of claim 31, wherein said first selecting step comprises the step of selecting a precomputed partial intersymbol interference estimate for a group of said plurality of postcursor taps based on past decisions, wherein a selected partial intersymbol interference estimate for a first group of postcursor taps is a selected intersymbol interference estimate.

36. The method of claim 35, wherein said step of precomputing said partial intersymbol interference estimates for a given group of postcursor taps further comprises the step of combining a (i) partial intersymbol interference estimate for a previous group of postcursor taps, and (ii) a combination of products of channel coefficients and possible symbol values for each tap of said plurality of postcursor taps.

37. A reduced-state sequence estimator for processing a signal received from a dispersive channel having a channel impulse response, comprising:

a decision feedback unit for precomputing intersymbol interference estimates based on a combination of (i) speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and (ii) a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state;

a branch metrics unit for precomputing branch metrics based on said precomputed intersymbol interference estimates;

a multiplexer for selecting one of said precomputed branch metrics based on a second past decision from a corresponding state;

an add-compare-select unit for computing a new path metric for a path extension from a corresponding state based on said selected branch metrics and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics; and

a set of pipeline registers to perform said reduced-state sequence estimation in two stages.

38. A reduced-state sequence estimator for processing a signal received from a dispersive channel having a channel impulse response, comprising:

a decision feedback unit for precomputing intersymbol interference estimates based on a combination of (i) speculative partial intersymbol interference estimates for a first postcursor tap of said channel impulse response, wherein said speculative intersymbol interference estimates are based on each possible value for a data symbol, and (ii) a combination of partial intersymbol interference estimates for each subsequent postcursor tap of said channel impulse response, wherein at least one of said partial intersymbol interference estimates for said subsequent postcursor taps is based on a first past decision from a corresponding state;

a multiplexer for selecting one of said precomputed intersymbol interference estimates based on a second past decision from a corresponding state;

a branch metrics unit for computing a branch metric based on said selected precomputed intersymbol interference estimates;

an add-compare-select unit for computing a new path metric for a path extension from a corresponding state based on said selected branch metrics and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics; and

a set of pipeline registers to perform said reduced-state sequence estimation in two stages.

39. A reduced-state sequence estimator for processing a signal received from a dispersive channel having a channel impulse response, comprising:

a decision feedback unit for precomputing partial intersymbol interference estimates for each of a plurality of postcursor taps of said channel impulse response, wherein said partial intersymbol interference estimates are based on each possible value for a data symbol;

a multiplexer for selecting a precomputed partial intersymbol interference estimate for each of said plurality of postcursor taps other than a first postcursor tap based on a past decision from a corresponding state, wherein a precomputed partial intersymbol interference estimate for a first postcursor tap is a precomputed intersymbol interference estimate;

a branch metrics unit for precomputing branch metrics based on said precomputed intersymbol interference estimate;

a multiplexer for selecting one of said precomputed branch metrics based on a past decision from a corresponding state;

an add-compare-select unit for computing a new path metric for a path extension from a corresponding state based on said selected branch metrics and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics; and

at least one set of pipeline registers to perform said reduced-state sequence estimation in at least two stages.

40. A reduced-state sequence estimator for processing a signal received from a dispersive channel having a channel impulse response, comprising:

a decision feedback unit for precomputing partial intersymbol interference estimates for each of a plurality of postcursor taps of said channel impulse response, wherein said precomputed partial intersymbol interference estimates are based on each possible value for a data symbol;

a multiplexer for selecting a precomputed partial intersymbol interference estimate for said plurality of postcursor taps based on a past decision from a corresponding state, wherein a selected partial intersymbol interference estimate for a first postcursor tap is a selected intersymbol interference estimate;

a branch metrics unit for computing a branch metric based on said selected intersymbol interference estimate;

a multiplexer for selecting one of said precomputed branch metrics based on a past decision from a corresponding state;

an add-compare-select unit for computing a new path metric for a path extension from a corresponding state based on said selected branch metrics and determining a best survivor path into a state by selecting a path having a best new path metric among said corresponding computed new path metrics; and

at least one set of pipeline registers to perform said reduced-state sequence estimation in at least two stages.